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RECOILLESS RIFLE
TECHNICAL INFORMATION
INDEX
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RECOILLESS RIFLE TECHNICAL INFORMATION INDEX

January 1959 to June 1962

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INTRODUCTION

The Recoilless Rifle Technical Information Index (~~RRTII~~) is an index to reports and articles pertaining to the field of recoilless rifles. It is based on a master set of border punched cards, which are coded and notched for needle sorting of key information. Except for the coding, all data are reprinted in the Index. The original Index is designated PB8 (AD-235 535); it covered the period 1944-1958, and has 1142 citations. ↗

This Supplement adds 162 citations to the Recoilless Rifle Technical Information Index, PB8, bringing it up from the end of 1958 to 30 June 1962. Furthermore, a number of corrections are made to the original Index, and several additional ASTIA (AD-) numbers are given.

For a complete discussion of history, organization, and use of the index, see the Introduction to PB8.

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RRTII-1143

AD-305 799

Test of Shell, M36B1, HEP-T with Modified Base Closure; by L.R. LaBuwi. Aberdeen Proving Ground Report No. 1, Project OAC 56-187. March 1959. 26 pages. Illus. Confidential.

Shell was fired to check metal-parts security and accuracy at extreme temperatures, and to compare functioning against armor plate with standard shell.

RRTII-1144

AD-218 292

Determination of Cause of Malfunctions of Fuze, PIBD, M509, in Cartridge, HEAT, M34A1, For 106-mm Rifle M40A1; by L.R. La Buwi. Aberdeen Proving Ground, Project OAC 59-1C2, Report No. 1. July 1959. 16 pages incl. Illus. Unclassified.

Test firings of four production lots of Fuze, PIBD, M509, previously rejected, were conducted to determine the cause of failures. The M509 fuzes were fired from a 106-mm rifle, M40A1. Each fuze was assembled into an inert-loaded, M34A1 projectile, fired, recovered, disassembled, and examined. It was concluded that failure to arm was significant contributing factor to the failure of the fuzes to pass acceptance tests. It is recommended that a similar recovery test be conducted with the M509E4 fuze (which incorporated a modification that may reduce the frequency of arming failures) to determine the feasibility of using it in the M34A1 projectile.

RRTII-1145

AD-225 688

Test of Fuze, FI, BD, M509E4, in Cartridge HEAT, M34A1 for 106-mm Rifle, M40A1; by L.R. LaBuwi. Aberdeen Proving Ground Report No. DPS/OAC 1/50/123/1 September 1959. Illus, Unclassified.

One hundred fuzes were fired at various conditions to determine the reliability of arming. Ninety-seven were recovered and examined. Of these 94 had armed and functioned. Four fuzes conditioned at -40°F, and one at +125°F, armed but failed to function. It was concluded that the E4 modification to the fuze reduced the incidence of failure to arm in the M34A1 round, and that certain details be investigated as to effects on extreme temperature firing.

RRTII-1146

Investigation of the 106-mm Recoilless Rifle M40 Series Acceptance Test Records for the Industrial Mobilization Project, by G. Lefevre, Aberdeen Proving Ground (D & PS) Miscellaneous Report No. 286; April 1959. 30 pages Unclassified.

The records of 8894 rifles were investigated to accumulate and evaluate data on the 106-mm recoilless rifle. The test procedure and specification were generally satisfactory but a few minor changes are recommended. Proof firing is necessary to assure acceptability.

RRTII-1147

AD-217 710

Blind Primer Malfunction Tests of Artillery and Recoilless Rifle Ammunition; by H.E.M. Carothers. Aberdeen Proving Ground. DPS Report Misc. 295. May 1959. Illus, Tables. Unclassified.

The firing of artillery ammunition having a primer body without flash holes has shown that extremely high pressure can be developed. The firing tests recorded in this study were conducted to determine what degree of danger was involved when standard stock ammunition was fired with special blind, partially blind, and modified primers at ambient and extreme temperatures. During the tests four artillery cannons and one recoilless rifle were destroyed.

RRTII-1148

AD-228 290

Investigation of the 75-mm, M20 Recoilless Rifle Acceptance Test Records for the Industrial Mobilization Project; by G. Lefevre. Aberdeen Proving Ground Misc. Report No. 304. Nov. 1959. Illus. Unclassified.

Firing records pertaining to 9132 rifles were investigated to accumulate and evaluate data on the 75-mm recoilless rifle. It was determined that the acceptance test procedure was generally satisfactory, but the specification requirements were not sufficiently complete and concise to maintain quality assurance, thus necessitating recommended changes. It was concluded that the proof firing of each rifle was necessary to assure acceptability.

RTTII-1149

AD-204 824

Desert Test, 1957, of Rifle, Multiple, 106mm, SELF-PROPELLED, M50; by E.L. Bruber. Aberdeen Proving Ground, Project / Report No. T85-1401/397. August 1958. Unclassified.

Tests described are chiefly concerned with the vehicle. Bore-sight retention and mechanical function of the weapon systems were unsatisfactory when operated in the ready positions over dusty cross-country terrain. See also RTTII-1031.

RTTII-1152

Recoilless Guns; by Robert S. Hanson. Manuscript text. Agency and date unknown; probably Frankford Arsenal, 1945. In Frankford Arsenal Library. Illustrated. Has bibliography. Unclassified.

History of development of recoilless rifles from first recognition of problem (1857) to present. Mostly descriptive, some mathematics. Appendices on theory of interior ballistics and on design of recoilless rifles.

(See also later equivalent, RTTII-934).

RTTII-1150

AD-231 777

Limited Engineering Test of Modification Kit to Adapt the 106-mm Rifle, M40A1 to the Cargo Sled, M1A1, by G. Lefevre. Aberdeen Proving Ground D&PS OCO Project/Report No. T84-3013/11, February 1960, Unclassified.

Engineering Tests for physical characteristics, traverse and elevation limits, accuracy, stability, ruggedness, durability, installations, dismantling and maintenance requirements were conducted on the modification kit. With minor exceptions, it was generally satisfactory for adapting the 106-mm rifle, M40A1 to Sled, Cargo M1A1. Further testing under arctic conditions will be done.

RTTII-1153

FLAPPER Ammunition for Recoilless Rifles (Feasibility Study); by Ralph L. Beck, Stanley Dubroff. Frankford Arsenal Report R-1351. October 1956. 19+3 pages. Illus. Secret.

Report discusses proposed 90 mm T22 canister type rounds, and concludes that FLAPPER type has promise of marked superiority over other canister rounds. Further study is recommended.

RTTII-1151

AD-255 889

Accuracy and Time of Flight of Shell, WP-T, T269E16, for 106-mm Recoilless Rifle, M40A1; by J.C. Moore. Aberdeen Proving Ground, Project/ Report: T84-1120/3. September 1959. Illus., Tables. Unclassified.

At a range of 1000 yards, firings were conducted at ammunition temperatures of -40°F, +70°F and +125°F, with the M34A1 HEAT, M34B1, HEP, and T269E16, WP shell. The over-all accuracy of the T269E16 shell was found to be slightly better than that of the M34A1, HEAT shell and equal to the accuracy of the M34B1, HEP-T shell. It is recommended that the final engineering test be made and utilized for a final determination of the velocity for minimum mismatch of the T269E16, WP shell. (See also RTTII-1129).

RTTII-1154

Case, Cartridge, 90 mm T115E5 for Recoilless Rifle, 90 mm, T219E1 PAT; by W. F. Leeper. Frankford Arsenal Report R-1448. OCO Project T84-4018. 36+5 pages. Illus. June 1958. Unclassified.

Report describes development of T115E5 aluminum cartridge case, as a phase of development of T219E6 HEAT cartridge. Work included production processes in conjunction with four industrial manufacturers.

RRTII-1155

AD-307 177

Formulation of Design Characteristics of an Ultimate RAT Weapon System; by G. Schecter, D.E. Walters, and others. Frankford Arsenal Report R-11471, Project TSL-1020. November 1953. 38 pages, 3 illus., 7 tables. Confid.

Since kinetic energy rounds seem ruled out by muzzle energy limitations of recoilless rifles, the chemical energy HEP and HEAT rounds have the only currently satisfactory terminal performance. Because of high destructiveness needed, a caliber larger than 106 mm will be required. Improvement of ranging seems to be most important to attainment of hits. Consideration is given to the use of a pulsed light type ranging system, but it has been concluded that the spotting round, while it still falls short of the OCM requirement, is the most promising method for ranging.

Consideration has been given to interior ballistics, mechanical design, and rate of fire in an effort to arrive at the optimum design requirements of the system. Advantages to be gained by an increase of muzzle velocity are also explored.

RRTII - 1156

AD-306 985L

Preliminary Design Study for a Recoilless Weapon Solution for the Missile "A" Requirement; by M. Cohen, Frankford Arsenal Report R-11488, Project TSL-1021. January 1959. SECRET

This report concerns a preliminary design study to show how the Missile "A" requirements may be met by means of a recoilless weapon.

RRTII-1157

AD-313 530L

A Family of Recoilless Atomic Weapons for Direct Support - R. T. Fillman, W. J. Kroeger, D. E. Walters, Research and Development Group, Frankford Arsenal. Report R-1504, May 1959, AEC Order No. SF-56-1391; 67 pages, 28 illus. Confidential

This report discusses in general terms a basis which may be used for designing a family of recoilless weapons, of minimum weight and muzzle energy to reach a specified range. Consideration is given to single-shot, limited-life, and extended-life weapons; design concepts are suggested, for large caliber weapons, which may be practical for more detailed engineering design studies. The possibility of weapon breakdown is considered, for portability.

RRTII-1158

AD-229 048

A Theoretical Interior Ballistic Study of Recoilless High-Low-Pressure Guns; by D. J. Katsanis. Frankford Arsenal Report R-1513. June 1959. Unclassif.

The general theory of high-low-pressure recoilless guns is derived and discussed. Analytical solutions are obtained for the high-pressure section; performance stability is evaluated for tubular and cord-snapped propellant grains with a linear burning rate and for tubular grains with a plateau type burning rate. Analog simulations are made using an energy balance to provide a temperature correction; nonlinear burning is considered. The results of the computer study are compared with the analytical solutions.

RRTII - 1159a

AD-316 1161

Recoilless Rifle Systems, Ammunition, and Related Items. Status Report No. 1, Vol. VII. Frankford Arsenal Report R-1515A. OCO Projects TSL-1018, TSL-1020, TSL-1021, TSL-1120, TSL-1121, TSL-1122, TSL-1218, TRI-1063. March 1959. 53 pages, incl. 15 illus. Confidential.

(This card treats pages 1-16)
120mm System: Reactivation of Program. Tests of plastic propellant envelopes. Feasibility study of HAPPER projectile, and 120mm rifle therefore.
Hit probability analysis.
105mm and 106mm Systems: Feasibility studies and design data for FLAPPER and HEAT rounds.
90mm System: Status of M67 rifle, and plastic propellant envelopes for T249E8 rounds. Discussion of hit probability.

RRTII - 1159b

AD-316 1161

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 1, Vol. VII. Frankford Arsenal Report R-1515A. OCO Projects TSL-1018, TSL-1020, TSL-1120, TSL-1121, TSL-1122, TRI-1063. March 1959. 53 pages. Incl. 15 illus. Confidential.

(This card treats pages 17 ff)
Feasibility Studies of Large Caliber Recoilless Weapon Systems. (See F.A. Report R-1188, RRTII-1156)
General Studies - Status of work in ballistics, ferrous metallurgy, properties of material, SQAT weapon system. Feasibility study of a special application of recoilless weapons with graphical display of data. Objective and operating conditions of 75mm scale model of larger High-Low Systems, with table of gun and propellant constants. Work on blast measurements described. Status of work on improving hit probability. Summary of results of studies of erosion vs. rate of fire.

RRTII - 1160

AD-316 731L

Recoilless Rifle Systems, Ammunition, and Related Items - Status Report No. 2, Vol. VII. Frankford Arsenal Report R-1515B; OCO Projects TSH-1018, TSH-1020, TSH-1021, TSH-1120, TSH-1171, TSH-1178, TSH-1063. June 1959. 59 pages, incl. illus. Confidential.

Abridgement of Frankford Arsenal Report M59-11-2 (RRTII-1182), "1st Quarterly Progress Report, Development of 120mm Recoilless Weapon (HAW) System." Application of 106mm rifle M10 to armored carrier T114 including description of sequence of weapon operation. Progress and status of 90mm PAT rifle M67, with ammunition and accessories. General studies include: study of spectral analysis of pressure-time curves, with equations and results obtained by analog computer; examination of tensile data for ultra high-strength steels; improvement of hit probability by use of electromagnetic radiation; comments on several studies concerned with interior ballistics, hypervelocity systems, interim results of study of control of blast.

RRTII - 1161a

AD-316 926L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 3, Vol. VII. Frankford Arsenal Report R-1515C. OCO Projects TSH-1018, TSH-1020, TSH-1021, TSH-1120, TSH-1171, TSH-1178, TSH-1063. September 1959, pages 47, incl. illus. Confidential.

(This card treats pages 1-13)

Abridgement of Frankford Arsenal Report M59-11-3 (RRTII-1183), 2nd Quarterly Progress Report, "Development of 120mm Recoilless Weapon (HAW) System." The 10mm spotting pistol XM14 for the 90mm M67 rifle is shown mounted for trigger grip and for monopod firing. Means for converting the 10mm spotting cartridge XM75, to "high-low" operation is described, with suggestions for improving the poor uniformity found in preliminary tests.

RRTII-1161b

AD-316 926L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 3, Vol. VII. Frankford Arsenal Report R-1515C. OCO Projects TSH-1018, TSH-1020, TSH-1021, TSH-1120, TSH-1171, TSH-1178, TSH-1063. September 1959. 47 pages, incl. illus. Confidential.

(This card treats pages 14-17)

General studies includes metallurgical studies of ultrahigh-strength steel, covering plastic strain effects, and behavior of material in very light sections; some results of work in nonferrous metallurgy at ultralow temperatures; experimental work in connection with 75 mm single-shot launchers for SQAT application; summary of results of analysis of accuracy for proposed recoilless light assault weapon (LAW), and for standard recoilless weapons.

RRTII-1162a

AD-319 309L

Recoilless Rifle Systems, Ammunition, and Related Items-Status Report No. 4, Vol. VII. Frankford Arsenal Report R-1515D, OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215E. December 1959, 61 pages, incl. illus. Confidential.

(This card treats pages 1-15)

Abridgement of Frankford Arsenal Report M59-11-3 (RRTII-1183) "3rd Quarterly Progress Report--Development of 120 mm Recoilless Weapon (HAW) System." Results of field-type tests of mounting kit for 106 mm rifle M10 and M14 cargo sled. Results of first-phase firing tests of M10 rifle on armored carrier T114. Comparison of granular and sheet propellants in 90 mm HEAT cartridge, T219E6, and comments on a mechanical trouble. Continuation of "high-low" tests on rounds for XM14 spotting pistol.

RRTII-1162b

AD-319 309L

Recoilless Rifle Systems, Ammunition, and Related Items-Status Report No. 4, Vol. VII. Frankford Arsenal Report R-1515D, OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215E. December 1959, 61 pages, incl. illus. Confidential.

(This card Treats pages 16-17)

Photoelastic analysis of dynamic stress, with photos, of spotting rifle bracket. Results of tests on ultra-high strength steels. Non-ferrous metallurgy at ultra-low temperatures. Feasibility studies, proposed LAW (successor to SQAT). Optical methods of improving hit probability by flight correction, with response and characteristic curves. General conclusions, mathematical analysis of MAM hit performance. Theoretical and experimental work concerning various propellants in "high-low" systems. Further studies in high velocity ballistics. Experimental study to determine feasibility of method for evaluation of ignition system characteristics.

RRTII-1163

AD-318 276L

A New Method of Ignition Developed for the XM28 and XM29 Weapon Systems; by A. Levine. Frankford Arsenal (Pitman-Dunn) Report R-1513, OCO Project TN2-8051. April 1960. 29 pages, incl. illus. Confidential.

Theoretical and experimental investigations have led to the development of a simple and satisfactory ignition system for the XM28 and XM29 weapon systems. A full length ignition tube is used, with black powder, and a pyrocore extends the entire length of the tubes axis. The method appears quite practical. In the tests, ignition was electrical, though other means are contemplated.

RRTII-1164

AD-231 923

Application of Fracture Mechanics to Recoilless Rifle Problems; by C. N. Carman. Frankford Arsenal, OCO Project TSL-4024, Report R-1521. September 1959, 28 Pages, incl. illus., tables. Unclassified.

The principles of fracture mechanics are briefly reviewed. Included in this review are the equations for circumferentially notched bars in tension, centrally notched sheet specimens in tension, plastic strain zone correction, conditions for plain strain fracture, and maximum flaw size with its practical limitations. Fracture toughness values for 4330V (Mod + Si) steel, Vasco-Jet 1000 steel, and 300-M steel have been determined, using circumferentially notched specimens. These values have been corrected for plastic strain zone, analyzed for plain strain conditions, and used to determine maximum flaw size. Conclusions are given and recommendations made.

RRTII-1165a

AD-321 371L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 1, Vol. VIII. Frankford Arsenal Report R-1553A, OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215E, March 1960. 65 pages, incl. illus. Confidential.

Abridgement of F.A. Report M59-144-4 (RRTII-1184), 3rd Quarterly Progress Report on development of HAW. Abridgement of Materiel Review of 90mm M67 Rifle System, (MAW) (RRTII-1207). Included under "General Studies" are: further results of ultralow temperature metallurgy studies; improvement of hit probability by using radio techniques; theoretical study of hypervelocity and consideration of means of obtaining it.

(continued on card RPTII-1165b)

RRTII-1165b

Continued from Card RRTII-1165a

Zoning studies, involving plateau-burning propellants; report of noise abatement study at Fort Dix range; ignition studies in chamber; chemical study relating to combustible cartridge cases; mathematical study of decay of luminescence, in connection with "memory optics" for sighting instruments.

RRTII-1166a

AD-321 372L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 2, Vol. VIII. Frankford Arsenal Report R-1553B, OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215E. June 1960. 49 pages, incl. illus. Confidential.

Abridgement of Frankford Arsenal Report M59-144-6 (RRTII-1210) "5th Quarterly Progress Report -- Development of 120 mm Recoilless HAW System." Preliminary design study for adaptation of T114 Antitank Assault Carrier, intended for 106 mm rifle, M40 (BAT), to XM89 (HAW) system; this includes modified firing mechanisms, and an autoloading system. Description of improved break for M67 (MAW) rifle, and report on amfire. Interior ballistics, including high-low studies, of 10mm spotting cartridge XM75, for MAW.

(Continued on RRTII-1166b)

RRTII-1166b

(Continued from RRTII-1166a)

General studies: Fracture toughness data, high-strength steel. Consideration of VTOL as recoilless weapon carrier. Hypervelocity studies. Improvement of hit probability by use of electromagnetic radiation. Interior ballistics, including high velocity phenomena, and consideration of primary and secondary charges for optimum pressure-travel curves. Ignition studies at low temperature in vented pressure chamber. Experimental multiple charges. Chemical investigation of combustible cartridge case materials. Improvement of terminal performance of memory optics of sighting systems - evaluation of mathematical constants in equations.

RRTII-1167

Proposed Specification of an Infantry Rifle, Self-Propelled, (Code Name EIK); by Pitman-Dunn Laboratories. Frankford Arsenal Report R-1196, OCO Project TSL-4020. April 1954. Secret.

Abstract classified.

RRTII - 1168

AD-319 313L

Large Caliber Recoilless Rifle (EIK); by R.T. Fillman and D.E. Walters. Frankford Arsenal Report R-1533; Ordnance Projects TR1-1031, TR1-1063. 158 pages, incl. charts, drawings, color photographs. March 1960. Confidential.

Detailed results of feasibility study. Contents include interior and exterior ballistics; accuracy; blast; use as launcher of self-propelled projectile; comparison of several breech and chamber designs. Appendices include trajectory equations; zoning considerations; heat transfer and cooling; and records of observed data.

RRTII-1169

AD-304 604L

Resume of the Experimental Ballistic Data Obtained to June 1958 in the Development of the FA-1 System for Davy Crockett, by A. Cianciosi and A. Levine. Frankford Arsenal Report MR-679. June 1958. 34 Pages, Incl. Ills. Tables. Secret Report.

This report presents a resume of the experimental ballistic data obtained to date in the development of the FA-1 Davy Crockett weapon system in two calibers. Data obtained from analog computer studies are also presented.

RRTII-1170

AD-304 682L

Specified Interior Ballistic Design Parameters for FA-6 and FA-7 Davy Crockett Weapon System, by D. J. Katsanis. Frankford Arsenal Report MR-690. June 1958. 10 Pages, Incl. Illus., Tables. Secret

The interior ballistic design parameters for the FA-6 and FA-7 Davy Crockett weapon system are computed and presented in tabular form. The main features of the systems are discussed.

Results of analog computer studies for the FA-6 system are presented and important considerations in the design of an experimental weapon emphasized.

RRTII-1171

AD-209 145

Empirical Rules for Ballistic Devices, by H. Kahn, Pitman-Dunn Laboratories Group, Frankford Arsenal, Report MR-683, Project No. TSL-4024, July 1958, 14 pages; 2 illus. Unclassified.

A generalized, empirical pressure-time formula is set forth to permit rapid estimates of ballistic parameters. Velocity and displacement functions are derived from this relationship for the example of the recoilless rifle. Results are given by formula and graph.

Other useful formulae are derived to describe relationships among projectile energy, ballistic cycle times, travel, and muzzle velocities.

The procedure for these calculations is set forth and a typical calculation is demonstrated.

RRTII-1172

AD-304 683L

Estimation of the Davy Crockett Shot Pattern; by D. E. Walters. Frankford Arsenal Report MR-684. August 1958. Confidential

This Memorandum Report is concerned with the prediction of the round-to-round dispersion of the Davy Crockett weapon. It describes a simplified set of assumptions from which the random round-to-round variation was determined as a function of projectile weight and range.

RRTII-1173

Reaction Thrust Generator for Projectile Guidance and Possible Missile Guidance; by C. L. Fulton. Frankford Arsenal Report MR-689. October 1958. Confidential.

As part of a feasibility program for guidance and control of projectiles and missiles, it was necessary to design and develop a reaction thrust generator. Interior ballistic rocket computations were made, test units constructed, instrumentation developed, data analyzed, and prototype models test fired. The report gives the design characteristics and requirements of the prototype model. Six of these units have been incorporated in a 105 mm recoilless rifle round. These rounds were fired, and the reaction thrust generator functioned. The displacement of these rounds from the normal trajectory, as evidenced by the impact pattern on a vertical target, agreed with the computations based on the pulse thrust provided by the generators. (See Frankford Arsenal Report R-1425, RRTII-962.)

RRTII-1174

AD-305 182L

Overall Accuracy of the Davy Crockett Weapon Using a Spotting System; by D. E. Walters. Frankford Arsenal. Report MR-691. September 1958. Confid.

This report constitutes an introductory study of the miss distance of the main Davy Crockett weapon when it is synthetically implemented with a sub-caliber spotting system. The basic errors of the system are considered, and the effect of their interrelationship on miss distances is shown at maximum range. Under certain assumptions, the single shot chances of hitting with the main weapon are computed against various target sizes at two specified distances. This preliminary analysis shows that it is fairly difficult to hit directly a relatively small sized target with the main Davy Crockett weapon at maximum range.

RRTII-1175

AD-213 287

Development of a Spotting Cartridge for the 90 mm PAT T234 Recoilless Rifle System; by R. C. Reagan. Frankford Arsenal Report MR-702; OCO Project TSH-4018-R232. October 1958. 17 Pages, Incl. Illus., Tables. Unclassified

A caliber .405 FA T72 spotter-tracer cartridge was designed for use in the spotting system for the 90 mm PAT T234 Rifle. Small lots have been fabricated and tested for fulfillment of requirements. In the limited time for testing, the cartridge performed satisfactorily except for velocity dispersion. The fuse was not tested for functioning in impact at long ranges. Work should be continued to reduce the velocity dispersion to standard deviation. Also, firings should be conducted at longer ranges, to test the functioning of the fuse on impact.

RRTII-1176

AD-214 396

Ammunition, Caliber .50 Spotter-Tracer for use with the 106 mm Recoilless M40 System; by H. Whitmore, Jr., and Reed E. Donnard. Frankford Arsenal. OCO Project TSH-4020. Memo Report No. M58-10-1. February 1959. 31 Pages, Incl. Illus., Tables. Unclassified.

Two experimental BAT minor caliber cartridges were tested using Cartridge, Spotter-Tracer, Caliber .50 M8A1 (T189E3) as the control. It is concluded that the two experimental lots give an approximate match for the calculated velocity-temperature curve for the minor caliber round. However, both of the experimental lots exhibited pressure levels near the 38,000 psi limit at normal and cold temperatures and were significantly less stable ballistically in the base tap tests, and nose tap tests.

RRTII-1177

AD-306 691 L

U-BAT Fire Control Possibilities; by D.E. Walters. Frankford Arsenal Report M59-7-1; Project TSH-4020-R183. January 1959. Confidential.

This report compares the hitting ability of the various fire control techniques with which the U-BAT weapon might be implemented. It considers an optical range finder and a spotting rifle. A target-seeking projectile is also considered as having future potential. Of three fire control alternatives considered, the spotting rifle is shown to be the best solution to the U-BAT hitting problem because of its availability. The value of guided projectiles remains to be established in gun-fired systems; their feasibility is being intensively studied at this laboratory.

RRTII-1178

AD-306 610 L

A Proposed XM29 Spotting System; by D.E. Walters and S. Kusan. Frankford Arsenal Report M59-8-1, Project TSH-8051-R236. February 1959. Secret.

This report develops an argument for the use of a subcaliber spotting system for the XM29 weapon system. It shows that a large saving in ammunition weight is possible if a subcaliber projectile is used for spotting the target, instead of a full scale spotting projectile.

RRTII-1179

AD-308 814L

Miss Distance of the XM28 and XM29; by D.E. Walters and L.C. Santone. Frankford Arsenal Report M59-11-1. OCO Project TSH-8051. January 1959. Secret.

This memorandum report is an attempt to predict, from elementary considerations, the accuracy with which the XM28 and XM29 weapon systems can deliver their warheads. Computation of the magnitude of the over-all distribution of impacts show that the delivery accuracy depends only moderately on the range and on the exterior ballistic performance of the round carrying the warhead. It is fairly certain that the XM28 and XM29, in their final versions, will meet the accuracies called for in the military requirements.

AD-216 496

RRTII-1183

AD-313 937L

RRTII-1180

Extension of Exterior Ballistic Tables for Projectile Type 1; by L.C. Santone and J.H. Kaplan. Frankford Arsenal Report M59-13-1. OCO Project TN2-8051. March 1959. Unclassified.

Tables of trajectory components as functions of angle of departure, ballistic coefficient, and muzzle velocity, were computed. The tables give horizontal range in feet, time of flight in seconds, vertical and horizontal components of velocity, and terminal velocity.

The extension of the tables has been to ballistic coefficients below 1 and a range of muzzle velocities below 2000 feet per second.

RRTII-1181

120mm Recoilless Weapon System - A Proposal for the Reactivation of Development; by G. Schacter. Frankford Arsenal Report M59-11-1, October 1958. Confidential.

This report proposes the reactivation of the development of the 120 mm Recoilless Weapon System to provide an interim solution for the Heavy Antitank Weapon (HAW) requirement. Comparison is made with the standardized and improved versions of the 106 mm BAT (Battalion Antitank Weapon). Discussion is presented on the background, expenditures, design features, and major characteristics of components of both weapons, as well as recoilless weaponry in general.

RRTII - 1182

AD-312 845L

Development of 120mm Recoilless Weapon (HAW) System, (Quarterly Progress Report No. 1) by F.W. Dietsch. Frankford Arsenal Report M59-11-2, OCO Projects TS-1020, TSJ-1021. April-June 1959, 18 pages, incl. drawings, graphs, tables. Confidential.

Being the first of a series, this report lists (in addition to status and immediate plan: regarding development and production) study layouts and drawings, preliminary and target specifications and data, and consideration of human factors, concerning weapon, mount, sight and spotting weapon. The appendix includes a letter containing statement of importance in various areas.

RRTII - 1184

AD-314 926L

Development of 120mm Recoilless Weapon (HAW) System (Quarterly Progress Report #3); by F.W. Dietsch. Frankford Arsenal Report M59-11-4, OCHS Nos. 5520-12-432, 5530-12-532. October-December 1959. 42 pages, incl. illus. Confidential.

Progress has been orderly on this project. There have been enough firings of both major and minor projectiles to indicate direction for further development activity. As the result of testing of the XM24 mount, a final determination has been made regarding several points.

An appendix describes two proposals which would extend the scope of the original project.

RRTII - 1185

AD-309 875L

Davy Crockett Delivery Systems; by G. Schacter; Frankford Arsenal Report M59-15-1. OCO Project TN2-8051. 37 pages, illus. August 1958. SECRET.

Report describes two Davy Crockett delivery systems under development at Frankford Arsenal, outlining progress from initial concepts, and expected technical progress.

RRTII - 1186

Proposed Concepts for Close Support Weapon Systems. Frankford Arsenal Report M59-17-1 (REGRAD Study Report No. 58-1), OCO Project No. TN2-8051. May 1959. 93 pages, incl. illus., tables. SECRET.

This report describes a feasibility study of weapon systems for close support based on knowledge gained from an extensive background of theoretical and experimental work done by this Arsenal, specifically on recoilless rifle weapon systems. Characteristics of 15 systems are described in detail. Appendices include studies of projectiles, fire control, fuzing.

RRTII - 1187

A Proposal for the Development of A Recoilless Weapon for Submarine Deck Armament, by P.W. Dietsch, R.W. Markgraf, G. Schecter. Frankford Arsenal Report M59-18-1, OCO Project TSL-1021. May 1957. 32 pages, incl. illus., tables, Confidential.

The development of a recoilless weapon to satisfy the requirements for a submarine deck gun has been found technically feasible. This report presents the results of a preliminary feasibility study of such a concept and proposes the establishment of a project for further studies leading to the development of a suitable recoilless weapon based upon successful recoilless rifle design principles. Discussion is presented on the requirements of submarine deck armament and the suitability and characteristics of recoilless weapons. Included is a special report by the American Machine and Foundry Co., a Frankford Arsenal recoilless rifle contractor, which is a study of the potentialities.

RRTII-1188

XM28 and XM29 Delivery Systems; by G. Schecter. Frankford Arsenal Report M59-20-1. OCO Project TN2-8051. December 1958. 21 pages, incl. illus., tables. Secret.

The report presents the current status of development of the XM28 and XM29 delivery systems. Each system is presented separately, and under each, two subjects are treated: (1) the principal military characteristics; and (2) the status of development and detailed description of major components.

RRTII-1189

AD-308 666L

XM28 and XM29 Delivery Systems - Status Report; by G. Schecter. Frankford Arsenal Report M59-20-2, OCO Project TN2-8051. May 1959. 15 pages, incl. illus., tables. Secret.

This report presents the status of development of the XM28 and XM29 delivery systems, as of November 1958.

RRTII - 1190

AD-309 142L

An Antimissile Small Arms Weapon; by D.E. Walters. Frankford Arsenal Report M59-22-1; OCO Project TSL-1021-R183. February 1959. Confidential.

This report proposes a lightweight, hand-held recoilless weapon firing contact-fuzed HE projectiles, which should be able to attack and defeat a missile with the expenditure of a few shots.

RRTII-1191

AD-309 125L

Human Engineering Evaluation of the XM28 System; by A.C. Karr. Frankford Arsenal Report M59-24-1, Project TN2-8051. May 1959. Secret.

This report discusses human engineering studies of an XM28 system and covers existing and potential design problems from the standpoint of the human operator.

BRIT-1192

AD-312 557 L

Hitting Probabilities of the Standard Recoilless Weapons; by D.E. Walters and E.F. Reilly. Frankford Arsenal Report M59-32-1, OCO Project TSL-4024-R183. June 1959. 14 pages, incl. charts, graphs. Confidential.

This report presents the single shot hitting probabilities of the 57 mm M18, 75 mm M20, 90 mm M67, 105 mm M27, and 106 mm M10 recoilless rifles against a standard tank target as a function of range under two sets of error assumptions. A simplified and a comprehensive set of errors are described from which the first round hit probabilities are computed for the recoilless weapons now in the hands of infantry. The comprehensive error assumptions, as given herein, are thought to be fairly realistic and should be representative of the environment in which these weapons will operate.

BRIT-1193

AD-312 558 L

Accuracy of the Recoilless Light Assault Weapon, by D.E. Walters. Frankford Arsenal Report M59-36-1, Project TSL-4024. April 1959. Confidential.

A brief study of an introductory nature was made concerning the over-all accuracy of a hypothetical hand-held, direct fire, recoilless Light Antitank Weapon.

Its hitting probability with a single shot against a tank sized target was computed under a set of input errors at distances between point blank and full range as a function of initial velocity, ballistic coefficient, fire control, and holding error.

BRIT-1194

Analysis of Zoning and Spotter Requirements for XM29 System; by G. Gaeman. Frankford Arsenal Report M59-16-1, OCO Project TN2-8051. August 1959. Includes illus., tables. Secret.

A matching subcaliber spotting rifle is considered for the dual zone XM29 system. An analysis is made of the relation between the matched ballistic coefficient and the system characteristics. A realistic range of ballistic coefficient values is considered and an attempt is made to determine an optimum value based on resulting system weight, system accuracy, spotter recoil, and maximum and minimum ranges.

BRIT-1195

AD-229 105

Computational Procedures for Trajectories Using the Method of Siacci; by J.H. Kaplan. Frankford Arsenal Report M60-8-1, October 1959. Unclass.

Chebyshev polynomials were used to approximate the Siacci altitude, inclination, and time functions in terms of the space function. These polynomials were then used to evaluate the functions for angle of elevation, time of flight, and angle of fall.

BRIT-1196

Hitting Performance of the Recoilless Medium Assault Weapon; by D. E. Walters. Frankford Arsenal Report M60-13-1, OCO Project TSL-4024. November 1959, Confidential Report.

This report indicates the level of delivery precision that a mantransportable, hand-held, shoulder-fired, direct-fire recoilless weapon is capable of developing when a spotting pistol is used for directing its fire. The hitting probability of a recoilless Medium Antitank Weapon (MAW) against a tank-sized target is predicted on the basis of realistic error assumptions as a function of muzzle velocity and holding error. Probabilities of hitting with a single shot are computed and presented, as well as those involving a combination of independently sized and fired first, second, and third rounds.

BRIT-1197

AD-316 812L

Human Engineering Evaluation - XM29 Delivery System; by A. C. Karr. Frankford Arsenal Report M60-25-1, OCO Project TN2-8051. March 1960. 37 pages, incl. illus. Confidential.

Human engineering study of early model XM29 includes mount, gun, fire control, maintenance. Boreighting and gun laying are evaluated, and comparison of spotting with subcaliber and major caliber weapons. Controls have been studied and certain changes recommended. Assembly and disassembly procedures were reviewed; some simple design changes would reduce number of maintenance tools. Further evaluation is recommended, with actual firings and complete weapon system.

RPTII - 1196

Sound Survey. FAM Associates, Inc. Report, Contract DA-36-033-C57-ORD-3365M. 8 pages, illus., Tables. February 1960. Unclassified.

Report covers an experimental feasibility study of noise suppression in connection with effect on neighboring communities, at Frankford Arsenal's firing range, Fort Det. Weapons were recoilless rifles, 100mm T170 and 120mm XM89 (HAW). Results indicated that further study was desirable, and that suppression appeared feasible.

RPTII - 1199

Propellant Envelope Studies for Recoilless Weapons. United Shoe Machinery Corp. Final Report, Contract DA-19-020-507-ORD-1269. June 1959. Unclassified.

Development and fabrication of propellant containers for 90 mm ammunition, for minimum residue.

RPTII - 1200

Recoilless Weapons. A seven-volume set prepared for Ordnance Department By The Franklin Institute under Contracts W36-031-ORD-7652 and -7708, Ordnance Project TFL-1000L.

This set is intended to be a reasonably complete collection of pertinent reports. See individual cards following this for detailed description. The seven volumes are as follows:

RPTII	Vol.	DATE	CLASS	SUBJECT
1200a	I	May 1948	S	The Recoilless Principle
1200b	II	March 1948	C	Nozzels
1200c	III	Dec. 1947	S	Interior Ballistics
1200d	IV	May 1949	C	Desctr. of Weapons -Pt.I:Devel-FA
1200e	V	May 1949	C	" " " " Pt.II:Add'l -US
1200f	VI	May 1949	S	" " " " - "III,IV,V,For'n
1200g	VII	April 1949	S	Bibliography

RPTII - 1200a

Recoilless Weapons: Vol. I - The Recoilless Principle. (See Card RPTII-1200) May, 1948, 166 + 20 pages, Illustrated. Secret.

Part I - History of Recoilless Gun Development.

Part II - The Recoilless Principle.

Part III - Discussion and Criticisms of Recoilless Weapons.

Discussion and comments on both foreign and domestic developments including rocket launchers, interior ballistics, tentative military characteristics, blast effects, value of muzzle brakes.

RPTII- 1200b

Recoilless Weapons; Vol II- Nozzles. (See Card RPTII-1200) March 15, 1948. 301 + 10 pages. Illustrated. Confidential.

Part I- Theory of Gas Flow Through Nozzles.

Part II-Nozzle design.

Part III- Erosion.

Part I has papers on the flow of compressible gases, isentropic flow, and perfect nozzles. Part II is extracted from Frankford Arsenal Report R-727 (RPTII-11). Part III has seven papers from NDRG, CIT, and ERL on experimental and analytical work on erosion.

RPTII - 1200c

Recoilless Weapons; Vol. III-Interior Ballistics. (See Card RPTII- 1200) December, 1947. 274 + 16 pages. Secret.

Part I- Interior Ballistic Theory

PartII- Subjects Related to Interior Ballistics

Part I has eight papers, from American, British, and German Sources.

Part II has papers from British Sources, treating chamber size, muzzle velocity vs. efficiency, booster charges, influence of peak pressure on weight.

RTII-1200d

Recoilless Weapons: Vol. IV - Recoilless Weapon Development at Frankford Arsenal. (See Card RTII-1200) May, 1949. 407 + 18 pages. Illustrated. Confidential.

This volume is collection of papers dealing with description, manufacturing reports, tests and firing records. With the exception of a Final Test Report of the T15 rifle (57 mm) by The Field Artillery Board, all papers are Frankford Arsenal reports, indexed elsewhere in the RTII, as follows:

FA Report	RTII	FA Report	RTII
R-461	1	R-741	12
R-475	2	R-756	13
R-541	3	R-775	15
R-551	4	R-783	16
R-574	5	R-788	17
R-727	11	R-794	18
		MR-329	203

RTII-1200e

Recoilless Weapons Vol. V - Additional Recoilless Development in the U. S. (See Card RTII-1200) May 1949, 508 pages, Illustrated. Confidential.

This volume treats chiefly recoilless mortars, their development, design manufacturing details, historical comments, and comparison with conventional weapons. There are also some descriptive notes on the 105 mm Howitzer. Papers are by NDRC, Allegany Ballistics Lab., Budd Wheel Co., and Franklin Institute.

RTII-1200f

Recoilless Weapons, Vol. VI - English, German, and Miscellaneous Recoilless Weapons. (See card RTII-1200) May 1949, 420 + 28 pages. Illustrated. Secret.

Foreign weapons are described, compared, and discussed as to production and specifications (proposed or actual). Large caliber weapons are considered.

RTII - 1200g

Recoilless Weapons; Vol. VII - Bibliography. (See Card RTII-1200) April 1944. 60 + 4 pages. Secret

This volume accumulates the annotated bibliographies, found distributed in the first six volumes of this group.

RTII-1201

AD-306-997

Human Engineering Studies on Battle Group Weapon Systems; by Ezra S. Krendel. Franklin Institute Report F-42233. OOO Project No. TW2-8051(R-236) Contract DA-36-034-ORD-2799RD. Feb. 1959. 11 pages; 5 illus. Secret.

Study of Davy Crockett covers fire control, and mount and accessories; problem areas include control, portability, maintenance, compatibility with personal gear, and with other aspects of the system. Two mock-up versions were available for study.

RTII - 1202

Investigation of the Effect of Blast from Recoilless Rifles, by J. Matsumine, Armour Research Foundation Final Report, Project TSL-4018, Contract DA-11-022-ORD-1227, June 1954. Unclassified. 55 pages, graphs, charts.

A study o. blast from 57mm, 75mm and 105mm recoilless rifles, both theoretically, and experimentally by the use of blast gages and pressure gages. Work included measurement of free-stream pressure field, and effect of pressure field on structures. A modification of blast wave theory was developed, giving closer agreement with observations. (See RTII-438 to -450).

RTTII-1203

ATI-115 344

Recoilless Rifle Backblast Danger Areas; by A. J. Dziemian, F. W. Light, Jr., and others. U. S. Army, Chemical Corps, Medical Laboratory, Navy Research Section. Report #72. Project 6-99-02-001, 11-99-02-001, July 1951, 69 pages. Photos, drawings. Unclassified.

Evaluation of danger from backblast of 57, 75 and 105 mm recoilless rifles, by experiment with goats in blast field. Photographs and description of damage to animals. Zones of danger are defined. Protection afforded by clothing is evaluated.

RTTII-1204c

AD-81 740

Investigation in Connection with Battalion Anti-Tank Recoilless Rifles; by Leo Shapiro and David Bendersky. Midwest Research Institute, Final Report on Contract DA-23-072-ORD-900, OCO Project TSL-4020. November 1955. 165 pages includes 73 figures. Confidential

(This card treats pages 54-114.) II-Heat Transfer Studies (Cont.). II-D. Reduction of Recoilless Rifle Temperatures. Study of three methods - external cooling, smear coating, treatment of propellant. Results are displayed graphically. II-E. Gun Temperature Safety Device. A device is described to prevent firing of an overheated rifle, using a melting-alloy film to release a lock; it can be reset after the alloy solidifies. II-F. Determination of Thermal Stresses. Experiment and Computation were used to determine combined thermal and pressure stresses for full length of chamber and barrel.

RTTII-1204a

AD-81 740

Investigation in Connection with Battalion Anti-Tank Recoilless Rifles; by Leo Shapiro and David Bendersky. Midwest Research Institute, Final Report on Contract DA-23-072-ORD-900, OCO Project TSL-4020, November 1955, 165 pages and 73 figures. Confidential.

(This card treats pages 1-144.) I. Sheet propellant studies. I-A. Firing tests of sheet propellant rounds in M26 rifle, modified with perforated cartridge case as integral part of chamber, indicate feasibility of case-less rounds for UBAT. I-B. Development tests of 105mm bore-size chamber, using sheet propellant, indicate non-conventional interior ballistics. I-C. (See Phase Report No. 1 on this Contract: RTTII-975.)

RTTII-1204d

AD-81 740

Investigation in Connection with Battalion Anti-Tank Recoilless Rifles; by Leo Shapiro and David Bendersky. Midwest Research Institute, Final Report on Contract DA-23-072-ORD-900, OCO Project TSL-4020, November 1955. 165 pages includes 73 figures. Confidential.

(This card treats pages 115-134.) III Gun Dynamic Studies. III-A. Determination of Recoil Force History. An accelerometer - oscilloscope system was used to measure recoil and study the production of vibrations in the T170 rifle. Curves are presented, showing the effect of frequency-filtering on the records. III-B. Effect of Launching Condition on Projectile Accuracy. A program was prepared (but not fired) for experimental check of theoretical dispersion due to barrel vibration. (See RTTII - 993)

RTTII-1204b

AD-81 740

Investigation in Connection with Battalion Anti-Tank Recoilless Rifles; by Leo Shapiro and David Bendersky. Midwest Research Institute, Final Report on Contract DA-23-072-ORD-900, OCO Project TSL-4020. November 1955. 165 pages includes 73 figures. Confidential.

(This card treats pages 145-53.) II. Heat Transfer Studies. II-A. (See phase Report No. 2 on this Contract. RTTII - 976.) II-B. Heat Transfer Coefficients from Propellant Gases to Rifle Walls. Experimental measurement methods using vented chamber. Uncontrollable variability caused abandonment of the investigation. II-C. Ballistic Effects of Heat Transferred to a Chambered Round. Rounds were fired from M40 weapon with a preheated chamber, to determine the ballistic effect.

RTTII-1204e

AD-81 740

Investigation in Connection with Battalion Anti-Tank Recoilless Rifles; by Leo Shapiro and David Bendersky. Midwest Research Institute, Final Report on Contract DA-23-072-ORD-900, OCO Project TSL-4020, November 1955. 165 pages includes 73 figures. Confidential

(This card treats pages 135-143.) IV. Ignition Studies. IV-A. Formulation of Criteria for Evaluating Recoilless Rifle Ignition Systems. This study enumerates those qualities which characterize a good ignition system. No quantitative results are indicated. IV-B. Development of CARDE Type Hot Gas Primer. Description of two basic designs - radial flow and axial flow for open stabilized projectiles. Development was carried up to firing test evaluation.

AD-313 587

RRTII-1205

Study of Pressure Gradients in Recoilless Rifle Chambers; by Strickland, Wennerstrom, et al. Aircraft Armaments Inc. Report EX-1776, Final Report on Contract DA-36-031-ORD-2781-RD, on Project TW2-8051. 226 pages, illustrated. September 1959. Confidential.

A study of pressure gradients within recoilless rifle chambers and their effect upon internal ballistic performance was the major specific objective of the theoretical and experimental program conducted. A more general objective was a more thorough understanding of various aspects of recoilless rifle internal ballistic phenomena. Since the mechanism of propellant loss from the recoilless rifle chamber is intimately connected with the problems associated with pressure gradient effects it will be noted that a considerable portion of the program was concerned with propellant loss and possible remedial action which would result in improved recoilless weapon performance. A detailed discussion of both the theoretical and experimental work accomplished is included.

RRTII-1206

AD-311, 009

Development of Outer Firing Mechanism for the HAW Weapon System. Aircraft Armaments, Inc. Report EX-1831, Contract DA-36-031-507-ORD-151RD. Nov. 1959. 15 pages, one photo, 2 dwgs. Confidential.

The center firing mechanism and a round adapter were designed, manufactured and tested with both dummy and live rounds. The final tests conducted on this project, on one prototype unit, were successful to the point of establishing the feasibility of the concept and design approach. A chambered barrel for the T2 M1L Weapon was used, and the T2/928 round.

RRTII-1207

AD-319 392L

Material Review on 90 mm, M67 Rifle System; by A. J. Grandy. Frankford Arsenal Report M60-30-1, 000 Projects TSL-4018, TSL-4218 (per OCTI 200-2-59) April 1960. 160 pages, incl. illustrations. Confidential.

The materiel research and development review covers standardized items: Rifle, 90 mm, M67; Cartridge, 90 mm, M371; Fire Control-Telescope M103 and accessories. Coverage is from three angles - research and development, industrial, and field service. Also included is discussion of improvement program concerning cartridge, hit probability, metallurgy, spotting pistol and cartridge, breach mechanism, telescope fire control.

RRTII-1208

AD-211 627

Development and Testing of the Modification Kit for Mounting Rifle, 106 mm, M10A1, on Sled, Cargo, 1-ton, M1A1; by J. H. Saydek. Frankford Arsenal Report M60-33-1 on OCO Project TSL-4018. May 1960. 29 pages, incl. illus. Unclassified.

Tests indicated impracticability of several carriers for the M10 rifle in the Arctic region. A modification kit was designed by USMARB for use with the M1A1; this proved successful, with minor deficiencies. Adoption was not recommended, however, because of limited need.

RRTII-1209

AD-316 956L

Development of 120 mm Recoilless Weapon System, XM89; Quarterly Progress Report No. 4; by F. W. Dietsch. Frankford Arsenal Report M59-11-5. OCMS No. 5520-12-432, 5530-12-532. January - March 1960. 67 pages, incl. illus. Confidential.

Blocks of ultrahigh strength steel was made, roughly wedge shaped, with irregular sections; they were subject to different heat treatments, for determination of warping and changes in dimensions; specimen drawing and observed data are given. Mount, and spotting rifle adjustments, are shown in detail in numerous photographs. Development tests of HEAT cartridge, XM119, are described, including static stand-off tests. Interior and exterior ballistics are analyzed, with several propellants. Comparison of different tracers in spotting cartridge XM108. Human factor study, in handling of weapon, is described; XM89 is compared with BAT.

RRTII-1210

AD-318 887L

Development of 120 mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 5; by F. W. Dietsch. Frankford Arsenal Report M59-11-6. OCMS No. 5520-12-432, 5530-12-532. April - June 1960. 72 pages, incl. illus. Confidential.

Drawings of XM-89 (HAW) weapon. Metallurgical data on 200Kpsi steel. Tests to improve aerodynamic design of XM119 round, and other development tests for round and components. Ballistic evaluation of frangible propellant containers. Studies of propellant granulation and ignition, accuracy, and strain compensation. Outline and assembly drawings of spotting rifle (XM90) and cartridge (XM108). Improvement of spotter tracer cartridge (XM108). Consideration of BAT vehicle mount (T111) as a carrier for XM89. Firing records for XM119 HEAT round, and XM108 spotter-tracer.

RRTII-1211

Evaluation of Modification Kit for Mounting 106 mm Recoilless Rifle on Carrier, Light Weapons, Infantry, 1/2-Ton, 4 x 4, M274 (Mechanical Mule). U. S. Army Infantry Board (Ft. Benning), Project No. 2749. July 1959.

RRTII-1214

AD-239 515

Evaluation of Multilite Sights. U. S. Army Infantry Board (Ft. Benning), Project 2885. June 1960.

Tests were made to determine whether further development was warranted in connection with 106 mm recoilless rifles, and other weapons.

RRTII-1212

Military Characteristics of Medium Assault Weapon. U. S. Army Infantry Board (Ft. Benning). Project No. 2825. January 1959.

RRTII-1215

AD-239 314

Service Test of Modification Kit for Mounting Rifle, 106 mm, M40A1 on Sled, Cargo, 1-Ton, M4A. Army Arctic Test Board (Ft. Greely) Report on Projects ATB3-30 and NR502-09-010. May 1960. 18 pages, incl. illus. Unclassified.

RRTII-1213

Evaluation of Cartridge, 106 mm, Dummy, M368. U. S. Army Infantry Board (Ft. Benning), Project 2855. March 1960.

RRTII-1216

Feasibility and Design Study of Supersonic Infantry Rocket; by E. H. Buchanan, E. W. Thompson. Picatinny Arsenal Technical Report 2349, Dept. Army Project 517-01-022. Sept. 1956, 14 pages, 4 figs. Confidential

Feasibility study to adapt Infantry rocket to limited antitank shoulder-fired use. It is concluded that supersonic Infantry rocket is feasible. Existing thin-web propellants will give necessary burning rates. Redesign required where launcher serves as motor wall, and motor is reduced to thin boom. Propellant surrounds boom. A cartridge case element can be designed.

RRTII-1217

AD-307 140

A Brief Analysis of Medium Anti-Tank (MAT) Systems and the Usefulness of the Supersonic Infantry Rocket (SIR) as such a weapon; by Sidney Jacobson. Feltman Research and Engineering Laboratories, Picatinny Arsenal, Report ORDBB-TE5-6, Ord. Proj. T4-426. April 1959. 9 pages. Secret.

On the basis of computed probability of first round hit, the proposed weapon (SIR) is shown to be the proper fulfillment of the requirements for MAT. According to the computations, it is the only weapon fulfilling the requirements with a hit probability greater than a certain stated value.

RRTII-1218

AD-313 982

Ignition Studies of Igniter Designs for Davy Crockett (XL-28) System; by H. Haseman. Picatinny Technical Note No. 35. Project TN2-8051. Dept. of Army Proj. 512-15-108. December 1959. 14 pages. Confidential.

Three types of igniters tested: the Frankford Arsenal design and two Picatinny Arsenal designs. Rounds were conditioned at 70°, -40°, & 125°F and fired. Velocity uniformity was the same in all, but ignition delay was shorter in PA Type B. This is expected to mean improved ballistic uniformity.

RRTII-1219

AD-303 018

An Examination of an 82-mm Recoilless Anti-Tank Gun "Taranisnic"; by C. Brierclyffe. Canadian Armament Research and Development Establishment (CARDE) Technical Memorandum 177/58. February 1958. 73 pages, incl. 35 figures. Secret.

This is an analysis of a Czechoslovakian platoon antitank recoilless gun, 82 mm, manufactured in 1954. It covers performance, manufacture, and design. Discussion of warhead and shaped charge, internal and external ballistics and accuracy, launcher, safety features, mechanical construction and comments.

RRTII-1220

AD-316-787

A Feasibility Study of the Internal Ballistics of a New Medium Anti-Tank Recoilless Gun; by J. Mar. Canadian Armament Research and Development Establishment (CARDE) Technical Memo No. 292/59, March 1960. 31 pages, incl. 7 charts and graphs. Secret.

A study is presented on the internal ballistic feasibility of a new recoilless gun proposed as an improvement over existing weapons. Although only moderate muzzle velocities have been attained in a wide temperature range, with an experimental mockup, indications are that considerably better velocities are theoretically feasible. Computers were used extensively, and a programming chart is included.

RRTII-1221

AD-321 121

Optimization Study of 120mm HAW Rifle; by C.F. Hooper, T.O. Stastny, N.L. Hyman, R.G. Strickland. Aircraft Armaments Interim Report ER-19511, on Contract DA-36-034-ORD-29/1RD. 114p. December 1960. Confidential.

This is a study of an optimum chamber with respect to reliability, piezometric efficiency, and ballistic efficiency. Analysis and tests, for evaluation of the relation of muzzle velocity to variations in propellant loss (geometry dependent) indicate significance of minor changes in chamber configuration.

RRTII-1222

Ballistic Studies on Rifle, 120 mm, HAW; by Samuel Levin, B. E. Paul, R. L. Olson. Ordnance Engineering Associates Summary Report, Contract DA-11-022-ORD-3152, OCO Project TSH-4020. June 1960. 67 pages, incl. graphs. Confidential.

Interior ballistic analyses were conducted to establish criterion for minimum weight of HAW chamber and nozzle. Heat transfer was studied to estimate heat input to representative cross sections. Analysis showed feasibility of liquid cooling of an automatic version of HAW. A statistical analysis was made of muzzle velocity and peak pressure reproducibility, considering all the usual interior ballistic variables.

AD-308 2/2

RRTII-1223

Design of FLAPPER Ammunition for Recoilless Rifles, by A. D. Corn and C. W. Haag. Whirlpool Corporation Evansville Ordnance Department Summary Report, Contract DA-33-008-507-ORD-1719, O. C. Project No. TW-422. Feb. 1959. Approx 125 pages, incl. illus., charts, tables. Secret.

Work covers complete design of ammunition, from mechanical construction of complete round to analysis of terminal effects. Application to three weapons was considered - the 90 mm M67 (MAW), the 106 mm M40 (BAT) and the 120 mm U-PAT.

RRTII-1224

Research and Development on Recoilless Weapon System: Super-PAT Rifle. United Shre Machinery Corp. Final Report on Contract DA-19-020-ORD-4567. September 1959. 20 pages, incl. illus. Confidential.

High-strength steel was used, in the development of a Super-PAT rifle, to obtain a weapon superior to the T2J4E3. Strain compensation was considered, as was a segmented type nozzle. Two weapons were constructed, for evaluation.

RRTII-1226

Mechanism Study, Large Caliber Recoilless Rifle. Leesona Corporation Final Report on Contract DA-19-020-507-ORD-4297, OCO Project TRI-1063. To period ending February 1960. 112 pages, incl. illus. Secret.

Work over a three year period is described, toward basic design and mechanism studies for a large caliber recoilless weapon, both self-propelled, and mounted on towed vehicle.

RRTII-1227

Design and Development of Frangible Propellant Envelopes for Recoilless Rifles; by David C. Francis. Leesona Corporation, Final Report on Contract DA-19-020-ORD-4724, OCO Project TSH-4018. April 30, 1960. 15 pages. Unclassified.

Glass fiber reinforced resin envelopes withstood rough handling, but left varying amounts of residue. Investigation was inconclusive, and further studies on the basis of an extended test program, are recommended.

RRTII-1225

Design and Development of Weapons Systems Components. Universal Winding Company Final Report on Contract DA-19-020-ORD-4600, OCO Project TSH-4018. July 1959. 16 pages, plus illustrations. Confidential.

An engineering study to develop and test a mechanical firing device, to eliminate existing igniter method of initiating the T2J4E8 round in the Super-PAT rifle. Three basic means were considered.

RRTII-1228

Characteristics of Standard Recoilless Rifles - Project Vista. California Institute of Technology Report ENGORD-108. October 1951. 29 pages. Confidential.

Characteristics of recoilless weapons based on information from training manuals and development reports. General studies, involving such questions propellant weight required for projectile velocity; total round weight including case and package; total weight of gun and associated equipment. Rifles studied were: 57 mm - T15E13, M18; 75 mm - T21, M20, T25; 105 mm - M27; 65 mm - T81 Test Model.

RETTI-1229

Engineering Testing Tables of APC Factors and Percent Remaining Life for Gun, Howitzer, and Recoilless Rifle Tubes; by E. H. Biel. Aberdeen Proving Ground Project T4-117, Report No. 1. January 1949. Illustrated. Unclassified.

Table of "Equivalent Full Charge" factors and percent remaining life were formulated for all standard, most obsolete, and most experimental weapons, from caliber 3/ mm to 280 mm.

RETTI-1230

AD-306 329

Investigation of Pressure Levels of Various Propellants in Rifle, 90 mm, T219EL, by M. Dutschke. Aberdeen Proving Ground, OQ Project/Report No. TSH-1218/5. March 1959. Confidential.

RETTI-1232

AD-307 365

Winter Test, 1959, Fort Churchill, Manitoba, Canada, Rifle, 90mm (IAI) T219EL, Weapon System; by G. T. Watson. Aberdeen Proving Ground. Project/Report Number CS-101/529, TSH-1018/9, TSH-4218/4. May 1959. Confidential. Illustrated

RETTI-1233

Development Test of Shell, HEAT, T219ES8 for 90 mm Rifle, T231; by W. Dutschke. Aberdeen Proving Ground Report DPS/TSH-1718/6. September 1959. 72 pages, incl. illus. Confidential.

Tests were conducted to determine metal parts security, and to investigate ignition - hole design in the boom.

RETTI-1231

A Determination of Data on Ballistics, Accuracy, and Stability of Folding Fin Projectiles in Comparison with T4050 Projectiles. Aberdeen Proving Ground Firing Record P-61210, on Project TH2-8051. Test Date March 1959. 31 pages plus illus. Secret.

Abstract Classified.

RETTI-1234

AD-235 711

Aiming Distance of Fuze, PIED, T276E8 in Cartridge, HEAT, M371, for 90-mm Rifle, M67; by F. A. Pecoraro. Aberdeen Proving Ground Project/Report TSH-1018/12. April 1960. 16 pages, incl. illus., tables. Unclassified.

Two designs of fuzes were tested in modified projectiles to indicate fuze functioning upon aiming. The aiming distance was improved over previous designs. The reliability of aiming, however, was less than desired. It was recommended that fuzes of good quality production be tested more extensively.

RRTII-1235

AD-316 759

Winter Test, 1960, Fort Churchill, Manitoba, Canada, of Rifle, 90mm (MAW) M67 (T219EL) Weapon System, and of Cartridge, 90mm, HEAT, M371 (T219E6) with M5 Propellant; by A. C. Peck. Aberdeen Proving Ground Project/Report TSH-1018/13, TSH-1218/9. May 1960. Incl. illus., tables. Confidential.

RRTII-1238

AD-313 953

Summer Desert Test, 1959, Yuma Test Station, Yuma, Arizona, of Rifle, 90 mm MAW, T219EL (M67) Weapon System; by G. T. Watson. Aberdeen Proving Ground Project/Report Nos. TBS-1101/533, TSH-1018/10, TSH-1218/7. November 1959. Confidential

RRTII-1236

AD-238 358

Final Engineering Test of Shell, WP-T, T249EL, for 106 mm Recoilless Rifle, M10A1; by J. C. Moore. Aberdeen Proving Ground Project/Report TSH-1020/30. Illus., tables. June 1960; Unclassified.

Tests included 100 yd jump firings, vertical target accuracy and time of flight at 500 yd and 1000 yd, fuze sensitivity (graze and target impact), impact - safe distance test of T28/21 fuze, charge establishment, velocity uniformity; also combined excess pressure - metal parts security. Questions of velocity for minimum mismatch with M31A1 and M31A3 could not be resolved. Except for improvement in loading seal, no changes were recommended, since immediate production is not contemplated.

RRTII-1239

AD-317 661

Check Test of 90-mm Recoilless Rifle, T219EL (Modified) and Ammunition (Modified). Army Arctic Test Board (Ft. Greely) Report, Project ATB3-20. May 1960. 17 pages incl. illus. Confidential.

RRTII-1237

AD-238 189

Test of Fuze, PI, HD T278E7, in Cartridge, HEAT, M31A1 for 106-mm Rifle M10A1; by J. C. Moore. Aberdeen Proving Ground Report Misc. 321, June 1960. Includes tables. Unclassified.

Report gives results of tests of functioning on armor plate, functioning on graze impact, and arming distance. It appears from tests that fuze is satisfactory for intended use, but this should be supported by further firing tests.

RRTII-1240

Rate of Fire in Recoilless Rifles; by R. Boritz. Frankford Arsenal Report M50-3-1, OCO Project TSH-1024. September 1959. Unclassified.

It is possible to calculate maximum permissible sustained rates of fire, and a method is given. The calculation of average system temperatures after firing a specified number of rounds, at specified times, with specified external conditions, is presented for several different assumptions. Cooling methods are discussed. There are sample calculations.

RPTII-1241

Characteristics of German 8cm FMK 8463 (High-Low Pressure Gun); by M. A. Hopkins. Aberdeen Proving Ground Project/Report TPI-1000B/3; January 1948. 12 pages plus appendix and illus.

Investigation and study of interior and exterior ballistic and performance characteristics of subject rifle.

RPTII-1244

AD-242 201

Functioning Test of Fuze, M309E4, in Shell, HEAT, M344A1 for 106 mm Rifle M40A1; by W. Dutschke. Aberdeen Proving Ground Report DPS-27. August 1960. 10 pages, incl. illus. Unclassified.

Tests were made to determine cause of fuze failures. Recommendations for improvement of reliability are made.

RPTII-1242

Arctic Tests of 75mm Rifle T25 (R2C); by W. J. Brennan. Aberdeen Proving Ground Project/Report TSP-1015/3, and Second Partial Report on TPI-0100, Part II. July 1949.

RPTII-1245

AD-241 318

Ballistic Investigation of Ammunition Components used for Acceptance of 106 mm M40A1 Recoilless Rifles; by J. C. Moore. Aberdeen Proving Ground Report DPS-28. August 1960. 23 pages, incl. illus. Unclassified.

An investigation into rejection of M40A1 rifles because of excess recoil led to demonstration that the particular lot of cartridge cases used was a major source of trouble. Recommendations are made to improve the test procedure.

RPTII-1243

AD-42693

High Angle Firings of Recoilless Rifles, 57mm, 75mm, 105mm, 106mm; by F. B. Poughkeepsie, Aberdeen Proving Ground Project/Report TSP-1020/10. September 1954. 76 pages. Unclassified.

High angle firings were conducted, using present mounts, carriages, and vehicular mounts, to determine maximum practical elevation at which recoilless rifles can be fired, and the ballistic performance of fin-stabilized shell at high angles.

RPTII-1246

AD-251 495

Desert Summer Environmental Test of Cartridge, WP-T, T269E16 for 106 mm Recoilless Rifle, M40A1; by G. B. Podlin. Aberdeen Proving Ground Report DPS/OTA-55. March 1961. Unclassified.

Tests included accuracy, time of flight, fuze sensitivity on graze and impact. In these tests, the cartridges appeared better than the M344A1, with which they were being matched. They also showed better trajectory match with the M344A1, than in previous tests. Fuze was satisfactory on ground impact, not on graze. Smoke cloud was satisfactory.

RRTII-1247
AD-320 971
Establishment of a Granular Propellant Charge for Cartridge, HEAT, 90 mm, M374, and Investigation of Projectile Metal Parts Security in Recoilless Rifle M67; by W. G. Holliday. Aberdeen Proving Ground Report DPS-107 on DA Project 504-03-057. Incl. illus., tables. December 1960. Confidential.

RRTII-1250
AD-323 285
Development Test of Cartridge, XM119, for 120 mm Rifle XM99; by L. R. Labawi. Aberdeen Proving Ground Report DPS-184. May 1961. 1 v, incl. illus. Confidential.

RRTII-1248
AD-252 278
Investigation of the 57 mm Recoilless Rifle M18 Series Acceptance Test Records for the Industrial Mobilization Project; by G. Lefevre. Aberdeen Proving Ground Report DPS-145. March 1961. Unclassified.
Firing records for 16,620 out of 24,884 rifles tested were reviewed.
Acceptance test procedure and specification were generally satisfactory.
Proof-firing of each weapon seems necessary.

RRTII-1251
AD-256 917
Preliminary Engineering Test of T114 BAT Vehicle System (Weapon Dispersion) by J. T. Zitz. Aberdeen Proving Ground Report DPS-218. May 1961. Unclassified.
Four different conditions of mounting were tried for comparison with a control M1041 BAT weapon. No degradation in accuracy was noted.

RRTII-1249
AD-322 138
Function Test of Fuze, PIBD, T278E6, in Cartridge, HEAT M371, for 90 mm Rifle, M67; by M. S. Burches. Aberdeen Proving Ground Report DPS-160, on Project 504-03-057. March 1961. 7 pages, incl. illus. Confidential.
Fuzes were conditioned at -65, -40, and 70 F for tests including graze sensitivity. Results were good, but a larger sample is recommended to give greater confidence factor; also use of other projectile systems is suggested. (See also RRTII-1234).

RRTII-1252
AD-323 893
Development Test of Cartridge, 37 mm, Spotter, XM152, for Rifle, 37 mm, XM77; by L.R. Labawi. Aberdeen Proving Ground Report DPS-215 (Also issued as Picatinny Arsenal Report TPR-TE-265). June 1961. 1 v, incl. illus., tables. Confidential.

RTIII-1253

AD-325 242

Development Test of Cartridge, 37 mm, Sootler, XM1522, for Rifle, 37 mm, XM27; by L.R. LaBue. Aberdeen Proving Ground Report DWS-360. 17 pages, incl. illus., tables. October 1951. Confidential.

RTIII-1254

AD-323 672

Development Test of Fuze, ED, XM511, for Cartridge, Spotter, 37mm, XM1522; by L.R. LaBue. Aberdeen Proving Ground Report DWS-243 (Also issued as Picatinny Arsenal Report Tex-D3-246) June 1961. 111us. Confidential.

RTIII-1255

AD-322 637

Development Test of Cartridge, HEAT, 120mm, XM119; by D.J. Mavis. Aberdeen Proving Ground Report DWS-172. April 1961. Illustrated. Confidential.

RTIII-1256

Ballistic Studies of the 120mm Recoilless Rifle, XM89. Ordnance Engineering Associates Progress Report No. 11 on Project 2024. DA Project 502-00-010 (OCO T51-1020). July 1960. Confidential.

Analysis shows that strain compensation will be relieved by action of the thermal and gas pressure strain after firing about two rounds in a burst. The maximum variation in muzzle velocity during the first three rounds due to strain compensation is very small.

RTIII-1257

A System Evaluation Cartridge for the U-BAT Weapon System. Firestone Tire & Rubber Co. Report on Contract DA33-019-507-002-6. OCO Project T51-1020, TAL-1510, DA Project 5A-01-23-001. August 1960. 74 pages. Confidential.

Projectile XM119 for HAW was analyzed for weight, center of gravity, and moment of inertia. Stress effects were evaluated after a recovery test. Shaped charge and projectile body shape are evaluated, as were several propellant envelopes and primer tubes. Work uncompleted in this contract is being continued on DA33-019-002-1000.

RTIII-1258

AD-321 036 L

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 6, by F.W. Dietsch. Frankford Arsenal Report M59-14-7. OOMS No. 5520.12.132. 5530.12.532. July-September 1960. 70 Pages, incl. illus. Confidential.

Development continuing according to plan. Decision was made to use 140,000 psi Y.S. steel, but the 200,000 psi Y.S. steel is still a possibility for the future. Further metallurgical study of the latter is reported. Under especial study during the period were ignition of the main round, frangible propellant envelopes, and comparison of spotter-tracer mixes.

RRTII-1259

AD-322 557L

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 7, by F.W. Dietsch. Frankford Arsenal Report M59-11-8. OCS No. 5520.12.432, 5530.12.532. October-December 1960. 66 pages incl. illus. Confidential.

Mechanical difficulties with the breech were found and remedied. A fairly intense program to evaluate designs and modifications of the XM119 cartridges was undertaken, with respect to exterior ballistics, chiefly. Further tests of frangible propellant envelopes were conducted, and testing of combustible envelopes was also undertaken. Mechanical and ballistic studies of the spotting rifle and cartridge (XM90 and XM108) resulted in improved design, and spotter rifle information. A study was made of left vs. right handed gunners in both left and right side positions; results favored left side for both groups, but by a very small margin.

RRTII-1260

AD-326 060L

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 8, by F.W. Dietsch. Frankford Arsenal Report M59-11-9. OCS No. 5520.12.432, 5530.12.532. January-March 1961. 19 pages incl. illus. Confidential.

Stress analysis shows that greater wall strength is required for pressures developed by the round. Difficulty with breech mechanism caused it to be brought under careful scrutiny; not only was there binding, but the firing mechanism developed increasing trigger pull with successive firings. Work has been done in the construction of a lightweight mount. Further work on frangible and combustible propellant envelopes is reported. Spotting system was investigated, especially with regard to accuracy, velocity. Ballistic results of tests at Aberdeen are given as well as firing tables from Frankford's facility.

RRTII-1261

AD-326 069L

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 9. Frankford Arsenal Report M59-11-10. OCS No. 5520.12.432, 5530.12.532. April-June 1961. 100 pages incl. illus. Confidential.

This report includes an account of development of weapon modification to use metal-case rounds, known as XM89E2; the original weapon, for frangible cases, is XM89E1. Considerable improvement has been made on the M1, and also in the XM90 spotting rifle, and a major improvement in the spotting round, XM108. Extensive ballistic studies and tests were run, both interior and exterior. Human engineering studies were made, including crew organization, to determine procedure and time to set up and fire the XM89 system; details are given.

RRTII-1262

AD-328 289

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW); Quarterly Progress Report No. 10; Frankford Arsenal Report M59-11-11; OCS No. 5520.12.432, 5530.12.532. July-September 1961. Confidential.

The XM89E2, using metal-cased cartridges, is redesignated XM105. Work on the XM89E1 is indefinitely suspended. Section A of report covers XM105. Program of chamber pressure, record balance, stress study reported for XM105. Cartridge XM119E2, used with rifle XM105, studies for charge establishment, ballistic uniformity, and other interior ballistics. Improvements progressing on spotting rifle and cartridge. Detailed human engineering evaluation of gunners' position (right or left handed) is given. Present status of XM89 is included for record, in Section B.

RRTII - 1263

AD-325 119L

Control Friction and Control Ratio Studies of the 120mm Heavy Antitank Weapons; by G.E. Rowland, A.C. Karr, O.W. Ehrman. Frankford Arsenal Report M61-26-1 on Projects 5520.12.432, 5530.12.532. October 1960. 44 pages, illus. Confidential.

Reasons are given for final selection of normal and fine-adjustment control ratios. Description of remote-control moving target is included. Comparison is made with BAT system (106mm Rifle, M10).

RRTII - 1264

AD

Notes on Development Type Materiel and Preliminary Technical Manual for 120mm Rifle System XM89 HAW. Prepared as Ordnance Corps publication. Frankford Arsenal Report PDLMS-1, on projects 131-4020, 131-4120. October 1960. Confidential.

Covers rifle, XM89, 15mm spotting rifle XM90, Tripod rifle mount XM121, and Elbow telescope XM110, with accessories.

RTII-1265 a

AD-304 123L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 3, Vol. VIII. Frankford Arsenal Report R-15530; OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215b. September 1960. 45 pages incl. illus. Confidential.

Includes abridgement of Frankford Arsenal Report R59-14-7 (RTII-1258) '6th Quarterly Progress Report - Development of 120mm Recoilless HAW System.' The T14 vehicular mount for the BAT weapon was apparently capable of performing its task, though there were minor points needing improvement; further development tests are to be made. Work on Shell, 106mm, WP, T269 is complete; this project will be shelved because of no immediate need, but it can be reactivated at any time. Concerning 90mm systems, the M67 (HAW) rifle, M371 round, and M103 sight are released from R&D to production; some investigations in progress are being carried to completion. A study of velocity variations in the spotting round for the HAW is being undertaken.

(Continued on RTII-1265b)

RTII-1265 b

AD-324 123L

(Continued from R-1265 a)

General Studies. Work on computer techniques for ballistics has developed a set of test matrices, useful for evaluating computer proposals and otherwise. Problems of loading a plastic model of nozzle, for three-dimensional stress analysis, are discussed. Further data on fracture toughness and crack propagation, for two kinds of steel, are presented. Further considerations regarding a proposal for Light Antitank Weapon (LAW) and Squadron Antitank (SQAT) are awaiting evaluation; some hardware is available for test. The T66 weapon (57mm) was studied for overall accuracy; a memorandum report will be issued. An optical seeker-head to improve hit probability is being developed; results are promising. Interior ballistic studies, experimental and theoretical, go into high velocity systems, ignition is closed test bomb, special burning rates ("plateau"), and possible use of rocket propellants. Mention is made of terminal ballistic studies, and memory optics for sighting systems.

RTII-1266 a

AD-361 536L

Recoilless Rifle Systems, Ammunition, and Related Items: Status Report No. 4, Vol. VIII. Frankford Arsenal Report R-15530; OMS Codes 5520-12-430, 5520-12-432, 5520-11-434, 5530-11-580, 5530-12-532, 5530-12-534, 5510-12-215E. December 1960. 34 pages, incl. illus. Confidential.

Includes abridgement of Frankford Arsenal Report R59-14-8 (RTII-1259) '7th Quarterly Progress Report - Development of the 120mm Recoilless HAW System.' T14 Mount for BAT is still giving problems with respect to cycling operations; Frankford is working on a weapon improvement to provide one more suitable for both ground and vehicle mount. Further details are given on the termination of R&D on the 90mm M67 system, and the simplified breech is discussed and illustrated; for this system, development is proceeding on the XM75 spotting cartridge (10mm) to attempt high-low operation.

(Continued on RTII-1265 b)

RTII-1266 b

(Continued from RTII-1266 a)

General Studies. Photoelastic stress analysis will cover HAW system, but initial experiments will apply to Davy Crockett nozzle. Physical data given for 4330V (Mod + Si) and Melion MX-2 steels. Considerable progress on optical seeker-head, for improvement of hit probability, is reported. Oscillographic Pressure-Time-Travel studies of the experimental high velocity ballistic system were made, with two types of projectile. Ignition studies, with pyrocore and ALBP in copper screens, were continued, with the development of a quantity of information; preliminary conclusions were reached, regarding ignition difficulties. Single grain rocket-type propellant was suggested as being of possible value; early experiments indicate otherwise. Use of frangible 20mm spotting projectiles appears promising, but testing program must continue for valid conclusions.

RTII-1267

AD-242 490

A New Method of Ignition Developed for the Davy Crockett XM28 and XM29 Weapon Systems; by A. Levine. Frankford Arsenal Report R-1513A, on OCO Project TN2-8051, January 1961.

Unclassified version of Confidential Report R-1513.
(See RTII-1163)

RTII-1268

AD-242 925

Fatigue Properties of Ultrahigh-Strength Steels; by C.M. Carran; Frankford Arsenal Report R-1562 on OCO Project T54-1021; June 1960; 30 pages, illus. Unclassified.

Rotating beam fatigue properties of 18 ultrahigh strength low-alloy steels were investigated. Results were interpreted in terms of tempering temperature, composition, and fatigue strength-tensile or yield strength ratio. Such steels, 200,000 psi Y.S., are being considered for recoilless weapons. Further work with copper-bearing steels is recommended.

RPTII-1269

AD-321 3141

Development of High Strength Steel for Gun, Recoilless, 155 mm, XM64; by C. M. Carman and R. T. Fillman; Frankford Arsenal Report R-1570, OMS Code 5530-12-533; September 1960. 55 pages, illus. Confidential.

Design considerations for the XM64 rifle are discussed. Study includes longitudinal and transverse tensile and impact properties, aging, reproducibility, production practices regarding heat treating. Steel is to have at least 200,000 psi Y.S.

RPTII-1272

AD-245 974

Study of Electric Initiation System for XM75 and XM76/XM77 Propelling charges; by J. H. Daniels. Frankford Arsenal report M61-3-1 on Project TN2-8051. August 1960. Unclassified.

Applicability of electrical initiation to propelling charges for XM28 and XM29 weapon systems was investigated. Thermal batteries were found to be suitable as power sources. Extreme temperature performance was investigated, and tests were made to find the effect of radiation. Models of a proposed initiation system and of a continuity checker were designed and built.

RPTII-1270

AD-351 745

Nozzle Spring Design for 90 mm Recoilless Rifle, T334; by A.J. Grandy. Frankford Arsenal Report E59-37-1, July 1959 on OCO Project T31-4018, DA Project 502-01-001. 27 pages, illus. Unclassified.

Design and manufacturing procedures for an unusual type spring, to operate a segmented nozzle, are set forth. It is intended to overcome disadvantages of conventional helical spring.

RPTII-1273

AD-246 534

Hitting Frequency of the 57 mm T66 Recoilless Rifle, by D.W. Walters and E.P. Reilly. Frankford Arsenal Report M61-5-1 on Project T31-4018-2183. September 1960. Unclassified.

This report indicates the first round hitting ability of the T66 rifle, with the HE T115E1 and HEAT T136E18 projectiles. The first-round hit probability on a given target is computed under simplified error assumptions.

RPTII-1271

AD-260 701

Quarterly Progress Report on Davy Crockett System; by L. Maiello. Frankford Arsenal Report M60-31-2, project TN2-8051. Period ending December 1959. Secret.

This series of reports covers the Davy Crockett (XM28 and XM29) weapon systems; the major weapons (120 mm XM63 and 155 mm XM64), the minor weapons (XM69 spotting rifle), the mounts (XM120 Tripod, and XM121 Ground), the 20 mm spotting cartridge, XM101; pertinent fire control equipment, and human engineering evaluation. (Report M60-31-1 of this series was never issued).

RPTII-1274

Some Aspects of the Decay of Phosphorescence; by J. Steinberg and E. L. Offenbacher. Frankford Arsenal Report M61-7-1 on Project TSL-4021. July 1960. 20 pages incl. illus. Unclassified.

This report covers a study about what affects persistence of phosphorescence and methods of maximizing the persistence. An expression is derived for persistence as a function of energy. Maximum useful range for the memory device, as applied to the weapon, is discussed.

RTII-1275

AD-258 418

Memory Optics for Recoilless Weapon Systems; by J. Weinberg, Frankford Arsenal Report W61-8-1; November 1960; 15 pages. Unclassified.

A memory device is proposed which has a phosphor screen to permit gunner to see the flash of a spotting round for sufficient time to get on target (a few seconds). Background of theory of phosphorescence is given, and requirements for phosphor material. Results of preliminary tests and future plans are presented.

RTII-1278

AD-325 386

Optimum Characteristics of Man-Portable Antitank Weapons; by J. A. Bruner, J. P. Young; Operations Research Office, Johns Hopkins University Tech Memo CRO-T-394, April 1961; 125 pages incl. illus., tables. Confidential.

RTII-1276

AD-321 626

Present and Future Repeating Recoilless Rifles and Their Integration with Tracked Vehicles in the 5- to 7-Ton Category. Minutes of Symposium at Harvey Aluminum Co., under auspices of Frankford Arsenal and Ordnance Tank Automotive Command, held June 1959. Issued by Frankford Arsenal, 1961; 126 pages, illustrated. Confidential.

This 3-day symposium covered many subjects, both general and specific. History and forecast; tactical usage, characteristics, description, and problems of adaption for existing and proposed weapons and vehicles, including revolver- and magazine-type rifles, M56 and T14 vehicles, M50 "OUTOS". Five industrial and three military organizations were represented.

RTII-1279

AD-263 377

Notes on the Weights of Guns, Mortars, Recoilless Weapons and Their Ammunition; by H. P. Gay. Aberdeen Proving Ground, Ballistic Research Labs. Memorandum Report 1360; Project 503-05-005, June 1961; 39 pages incl. illus. Unclassified.

Graphs showing weights of existing weapons and ammunition, used with graphical solution for maximum range, provide basis for estimate of weapon and ammunition weight to deliver projectile of given weight to a given range. Study of this material will improve understanding of weapon capabilities and limitations.

RTII-1277

Trunnion-Vented Repeating Recoilless Rifle - TVERR "TV Rifle"; Harvey Aluminum Report HA-1519; August 1960, 31 pages. Confidential.

A vehicle-mounted 120-mm repeating recoilless rifle weapon system is proposed, for firing from a fully enclosed turret. The means of accomplishing this is the chief point of the discussion.

RTII-1280

AD-323 892

Vehicular Test of the XM-29 Weapon System Mounted on Truck, Utility, 1/4-Ton, Lx1, M38A1; by J. T. Zitz, D. R. Correll. Aberdeen Proving Ground Report DRS-216, June 1961. Confidential.

RRTII-1281

Conceptual Designs Leading to a Second Generation Davy Crockett Weapon System. Ordnance Engineering Associates Proposal 6086, December 1960. 32 pages. Secret

Design concepts incorporate zoning and temperature compensation techniques. Several possibilities are explored.

RRTII-1284

Report on Recoilless Weapons for Army Aviation; by V. J. Cushing, D. M. Reilly. Engineering-Physics Company Report on Subcontract to Ordnance Engineering Associates. September 1960. Confidential.

Various armaments for aircraft, from small-bore weapons to recoilless artillery, are evaluated in a preliminary manner, with a further study program outlined. It is pointed out that blast is a problem.

(See also RRTII-1283)

RRTII-1282

AD-259 151

Study of the Breathing Effect on the H-21 Helicopter; by W. B. Peck, W. S. Nutley, et al. Vertol Div., Boeing Airplane Co. Report R-243 on Contract DA-36-034-ORD-3370, Project TN2-8057. 1961. Unclassified.

Investigation of blast effects of a recoilless rifle beneath a helicopter, to determine feasibility of in-flight firing of XM29 weapon. Three phases of study: (1) airframe static stress, (2) airframe dynamic analysis, (3) rotor investigations. Report is made concerning light-weight reinforcing, highly effective.

RRTII-1285

AD-263 204

Engineering, Design, and Development Work on Rifles, Machine Guns and Special Weapons. Professional Design Co. Final Narrative Summary on Contract DA-19-020-504-ORD-4947. July 1961. Unclassified.

RRTII-1283

Recoilless Rifle Army Aircraft Weapon Systems Evaluation. Ordnance Engineering Associates, Special Report 2024-2 on Contract DA-11-022-ORD-3152. (Prepared jointly with Engineering-Physics Company). 13 pages. October 1960. Confidential.

The subjects treated are firing accuracy (preliminary analysis), mounting of weapon in aircraft, and vulnerability of aircraft to countermeasures.

(See also RRTII-1284 and RRTII-1289)

RRTII-1286

Determination of Elastic Stresses in Chamber Sections of Recoilless Rifles; by P. P. Radowski; Watertown Arsenal Report WAL 731/407; February 1956

RRTII-1287

AD-326 430

Test of Shell, HEP-T, 90-mm, TLLE3 and Shell, HEP-T, 106mm M346A1 Against Armor Plate Targets of Various Thicknesses; Chamberlain Corporation. Report of Test No. 33 on Basic HEP R&D program, on Contract DA-11-022-501-ORD-2110. October 1961. 65 pages incl. illus. Confidential.

The M346 shell is intended for the recoilless M40 BAT Weapon.

RRTII-1290

AD-329 438

Development Test of 120-mm XM89 Battalion Antitank Weapon System; by L. R. LaBawi; Aberdeen Proving Ground Report DPS-513, OMS Code 5520.12.432. April 1962. 19 pages. Confidential.

Trajectory-matching tests of XM119 projectile and XM108 Spotter were made, and reported herein.

RRTII-1288

AD-324 841

Development of a New HESH Shell for 120 mm RCL BAT Gun; by J. M. Bickford, J. V. Woolcock. Armament Research and Development Establishment (Great Britain) MEMO (P) 20/61. July 1961. 7 pages, illus. SECRET.

RRTII-1291

Preliminary Data on GAP Weapon System as Applied to 120 mm Recoilless Rifle: Final Report on GAP Weapon System, Section I, by the Englander Company, Inc., on Contract DA-11-022-ORD-3531. May 1962, 84 pages incl. illus. Confidential.

GAP is developed as a means of achieving high probabilities of first round hit, against stated targets; it is considered for application to the XM89 weapon system. Of two methods of guidance considered, one seemed to have a marked advantage. Further studies are needed. (See also RRTII-1292 and RRTII-1293).

RRTII-1289

Ballistic Studies on 120 mm Recoilless Rifle, XM89; Ordnance Engineering Associates. Final Report on Project 2024; Contract DA-11-022-ORD-3152, OCO Project TSL-4020. December 1961, 52 pages incl. illus. Confidential.

This report covers both phases of the work under this contract. Phase I was for studies of propellant loss, effect of nozzle approach area on interior ballistics, nozzle blast; heat transfer, stress analysis, and cooling problems in an automatic weapon. Phase II was a weight reduction study, from interior ballistic and heat transfer considerations. The report contains a subject index to earlier reports on the contract, from which more detail can be obtained; these earlier reports are not, in general, included in this RRTII, except for RRTII-1222, RRTII-1256, and RRTII-1283.

RRTII-1292

Supplementary Studies to GAP Weapon System: Final Report Section 2; by the Englander Company, Inc., on Contract DA-11-022-ORD-3531. May 1962, 61 pages incl. illus. Confidential.

This section of the report covers an alternate aerodynamic arrangement, including rocket assist and folding fins, and a study (both analytical and experimental) of radio guidance. This work was done under subcontract by Armour Research Foundation. (See also RRTII-1291 and 1293).

RRTII-1293

Application of GAP Principle to TOW Missile; Final Report, Section 3; by the Englander Company, Inc., on Contract DA-11-022-ORD-3531. May 1962, 101 pages incl. illus. Confidential.

This section gives technical performance and design details, for application of principles to a specific missile. (See also RRTII-1291 and RRTII-1292).

RRTII-1294

Display of Colored Smoke Round for the 20 MM Weapon System XM28; by R.N. Jines. Aberdeen Proving Ground Report DPS-190; March 1962.
CONFIDENTIAL.

RRTII -1297

Concept Studies of Propellant Ignition Systems for XM29 Davy Crockett System; by A. LoPresti, D.J. Zauder. Picatinny Arsenal RJS Report No. 1; Project TN2-8051. July 1959. SECRET

RRTII - 1295

Installation Study, Aerial Davy Crockett System; Ordnance Weapons Command Report, March 1959. SECRET

RRTII - 1298

Static Stability and Drag Characteristics of the Final Davy Crockett Configurations; by W.F. Gallo, Picatinny Arsenal (Feltman Labs) Tech Memo 34, on OCO Project TN2-8051, October 1959.

NOTE: Available only at Picatinny Arsenal
Archive No. 8.98

RRTII-1296

Technical Development Plan - Battle Group Weapons Systems (Davy Crockett); Department of the Army, Office of Chief of Staff for R & D, report number OSCRD-21; May 1961. SECRET RD.

RRTII - 1299

Initial Safety Study of the Davy Crockett Weapon System; Picatinny Arsenal
Report ORDBB-TK-1181, March 1960. SECRET RD

RRTII - 1302

An Evaluation of the XM28 and XM29 Weapon Systems Against an Expected
Soviet Target Complex; by W.E. Gross, Jr. Picatinny Arsenal Technical
Note 1365; December 1960. SECRET

RRTII-1300

Development of Static Test Charge Assembly for Simulated Davy Crockett
Round; by G. Weingarten, G. Kristel, Picatinny Arsenal Technical Note 39
on OCO Project TS5-5001; March 1960.

An assembly was developed containing 50/50 stabilized red phosphorus and
finely divided (200/325 mesh) atomized magnesium, which functions without
case fragmentation and provides good spotting characteristics at a distance
of approximately 3000 yards.

RRTII-1303

AD-329 304

Development Test of Cartridge, 37-mm, Spotter, XM15E2 and XM116, for
Rifle, 37-mm, XM77; by L.R. LaBue, Aberdeen Proving Ground Report
DPS-547. May 1962. CONFIDENTIAL.

See also RRTII-1252, -1253, -1254.

RRTII - 1301

Report on Human Factors Study of the XM29 System; by J. Mydosh,
B. Jacobson. Picatinny Arsenal (Feltman Res. Labs.) Report. July 1960.
SECRET RD

NOTE Available at Picatinny Arsenal only.
Archive No. 8.992:3

RRTII-1304

AD-329 508

Development of 120mm Recoilless Heavy Antitank Weapon System (HAW);
Quarterly progress report No. 11. by H.S. Lipinski. Picatinny Arsenal
Report 159-11-12. October - December 1961. 30 p. incl. illus. CONFIDENTIAL.

Some changes in the barrel and the chamber of the XM105 rifle were adopted
as a result of strain analysis. Accuracy tests were performed with HAW
round, XM152. Spotting rifle XM90 was subjected to low temperature tests.
Improvement in tracer reliability and graze sensitivity is required in
the XM105 cartridge.

ERRATA AND ADDITIONS
to Publications Bulletin 8

PAGE

- 3 Below "BAG CHARGES", the word BARREL should appear as a main heading, and RIBBED AND RING REINFORCED as the first subheading under BARREL.
- Under BAT, in place of 616, 619 put 597-646.
- 4 Under CARTRIDGE, change SPIKE-NOISED to SPIKE-NOSED
- 7 Under FIRING TESTS AND FIRING RECORDS, read 108a. b, c, d instead of k98a, b, c, d.
- 8 Under FOREIGN, OTHER, read 1097-1102 instead of 1096-1099, 1100, 1101, 1102.
- 11 Under MAGNESIUM, read NON-FERROUS instead of NON-Ferrous.
- 12 Read main heading PRIMER, instead of Primer.
- 13 Under PROPELLANT GAS PRESSURE, add comma after MEASUREMENT.
- 14 Following heading RANGE FACILITIES, alphabetization incorrect. Ranging Methods should precede RECOIL; REMOTE CONTROL and Repeating Mechanism should follow RECOIL.
- 15 Read heading SQAT instead of SQUAT.
- 16 Under TERMINAL BALLISTICS, read GRAZE instead of GAZE
- 21 Near top of page, read subheading Spotters, Caliber .50 instead of Caliber .50 Spotters.
- Under Spotters, Caliber .50, Others, read 111a for 11a; and insert 1061.
- Under CARTRIDGE CASE, 2.75", read 111c for 11c.
- Under MOUNT, M19 read Motor instead of Moror.
- 22 Under RIFLE, 57mm, M18(T15), delete 28, 30; Add 31
- Under RIFLE, 57mm, T26, add 28.

- 25 Under M8(T46) read 1109 instead of 1190.
- 26 Add Report MR-654, RRTII-944. Also correct numerical sequence of MR-636 and MR-637.
- 29 Between BUDD and CADILLAC, insert BULOVA RESEARCH AND DEVELOPMENT CORPORATION 962
- Under MIDWEST RESEARCH INSTITUTE, add reference 647 to each of first four contracts; and add 648 under MISCELLANEOUS.
- 30 Under FOREIGN, CANADIAN, read 1116 instead of 1117.
- RRTII Entries in Reference Section
- 924b Abstract, line 4. For "copper becoming", read "copper-bearing".
- 942 Date for citation is April 1957
- 962 Add note: Prepared by Bulova Res. and Dev. Corp., as Final Report on Contract DA-30-069-ORD-1766.
- 1140 Add note: In two volumes.

ADDITIONAL ASTIA NUMBER ASSIGNMENTS

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